Met Office

NEWS

Atmospheric carbon dioxide to pass iconic threshold

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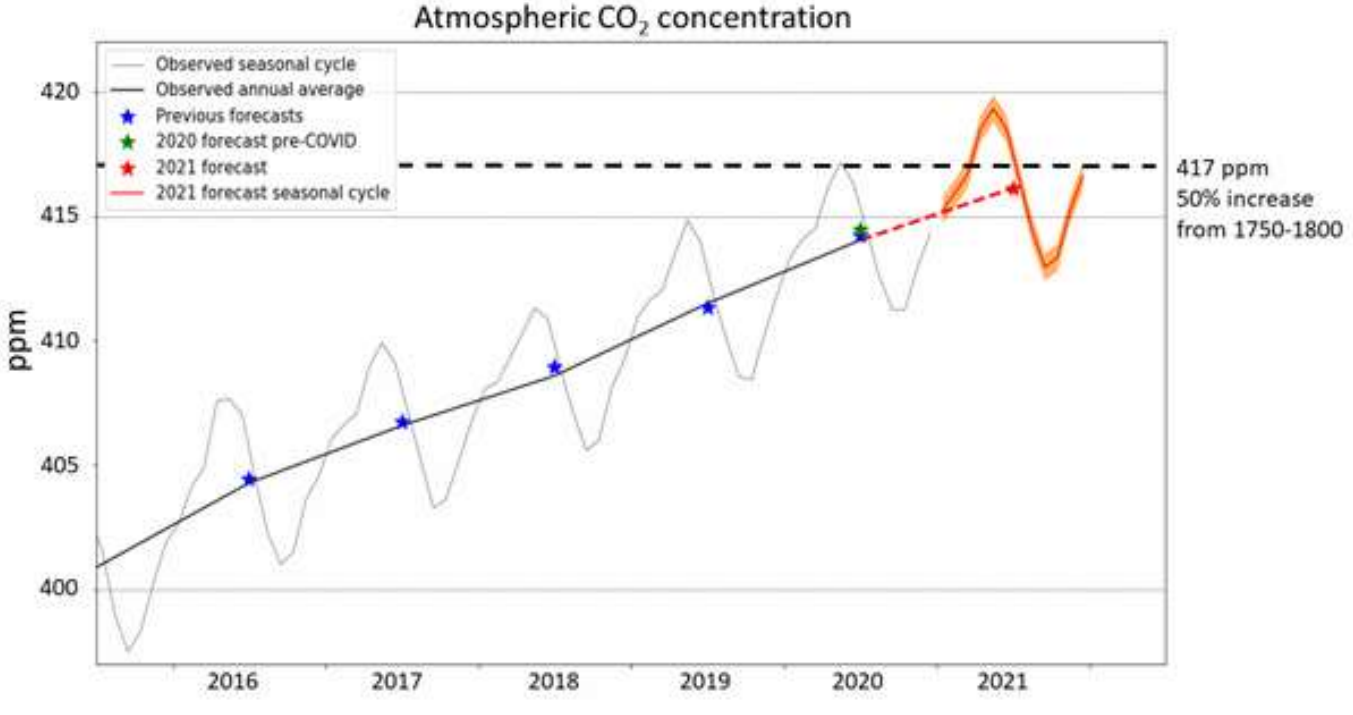
In 2021, carbon dioxide in the atmosphere will reach levels 50% higher than before the industrial revolution, due to human-caused emissions, says a Met Office forecast.

The Met Office predicts that annual average CO_2 concentration at Mauna Loa Observatory, Hawaii, will be 2.29 ± 0.55 parts per million (ppm) higher in 2021 than in 2020. This rise is driven by emissions from fossil fuel burning and deforestation, but will be slightly smaller than usual due to a temporary strengthening of natural carbon sinks. Weather patterns linked to the current La Niña event are expected to promote a temporary burst of growth in tropical forests that soak up some of humanity's emissions.

Carbon dioxide will continue to build up in the atmosphere

Despite these La Niña-related effects, CO_2 will still continue to build up in the atmosphere, and will exceed 417 ppm for several weeks from April to June. This is 50% higher than the level of 278 ppm in the late Eighteenth Century when widespread industrial activity began.



As usual, the annual peak - at new record levels in May - will be followed by a temporary fall in concentrations as ecosystems take up CO_2 during the northern hemisphere growing season – but from September onwards the CO_2 will continue to rise again. The annual average CO_2 concentration will be 416.3 ± 0.6 ppm.

Emissions have returned almost to pre-pandemic levels

Professor Richard Betts MBE, who leads the production of the Met Office's annual CO_2 forecast, said: "Since CO_2 stays in the atmosphere for a very long time, each year's emissions add to those from previous years and cause the amount of CO_2 in the atmosphere to keep increasing. Although the Covid-19 pandemic meant that 7% less CO_2 was emitted worldwide in 2020 than in previous years, that still added to the ongoing build-up in the atmosphere. Emissions have now returned almost to pre-pandemic levels, but their effect this year will be partly dampened for a while by the stronger natural sinks due to the La Niña."

Mauna Loa Observatory in Hawaii is the site of the longest-running continuous record of atmospheric CO_2 concentrations, which were begun in 1958 by David Keeling.

The iconic 'Keeling Curve' graph is a potent symbol of humanity's accelerating impact on the global climate system. CO_2 concentrations in the Keeling Curve record first reached 348 ppm, 25% above pre-industrial levels, in 1986.

Professor Betts added: "The human-caused build-up of CO_2 in the atmosphere is accelerating. It took over 200 years for levels to increase by 25%, but now just over 30 years later we are approaching a 50% increase. Reversing this trend and slowing the atmospheric CO_2 rise will need global emissions to reduce, and bringing them to a halt will need global emissions to be brought down to net zero. This needs to happen within about the next 30 years if global warming is to be limited to 1.5°C."

The Met Office has been issuing annual forecasts of the CO_2 at Mauna Loa since 2016, and has successfully predicted the influence of year-to-year changes in natural carbon sinks on the rate of CO_2 rise. In 2020, once it became clear that the pandemic would cause a temporary dip in emissions, the impact of this on the CO_2 rise was also successfully predicted.

The Met Office carbon dioxide forecast for 2021 can be found here.

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